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B_2H_6 , PH_3 or the like, if necessary) is fed from the supply duct 41 through the supply port 43 of the shower head 42, and the gas pressure is set at 10^{-1} to 10^{-3} Torr, for example, 10^{-2} Torr. The hydrogen-based carrier gas may be any gas that is produced by mixing an appropriate quantity of inert gas with hydrogen, for example, hydrogen, hydrogen + argon, hydrogen + helium, hydrogen + neon, hydrogen + xenon, hydrogen + krypton or the like. (This applies throughout the following description.) The hydrogen-base carrier gas is not necessarily required, depending on the type of the material gas. That is, there is known a method for forming polysilicon by catalytic reaction of silane alone without using the hydrogen-based carrier gas (known as a hot wire method), and the present invention can also apply to this method. --